

# EMC TEST REPORT

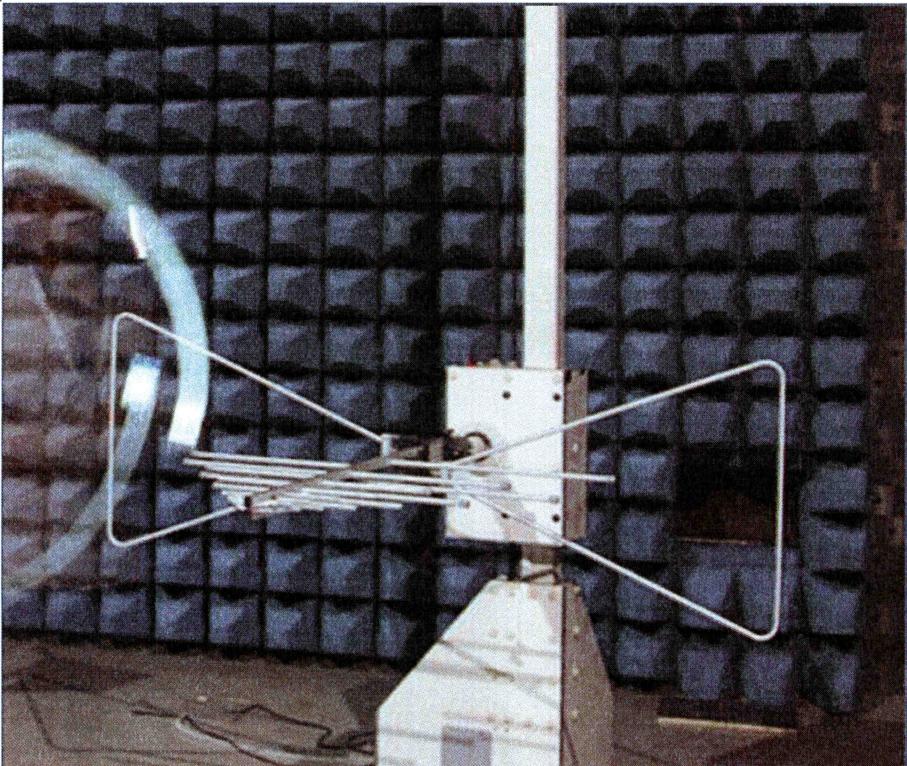
ISSUED BY  
Shenzhen BALUN Technology Co., Ltd.



FOR  
**Motion Sensor**

ISSUED TO  
Konec Home Pty Ltd

Suite 5.02 level 5 15 Talavera Road Macquarie Park NSW 2113  
Australia



Tested by:	Hu Qingshan
Hu Qingshan	
Date:	Aug. 12, 2021
BALUN	
Approved by:	Wei Yanquan (Chief Engineer)
Date:	Aug. 12, 2021

Report No.:	BL-SZ2140982-401
EUT Name:	Motion Sensor
Model Name:	RTCGQ11LM
Brand Name:	Aqara
Test Standard:	AS/NZS CISPR 32: 2015+AMD1:2020
Test Conclusion:	Pass
Test Date:	Apr. 28, 2021 ~ May 11, 2021
Date of Issue:	Aug. 12, 2021

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**Revision History**

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Aug. 12, 2021</u>	<u>Initial Issue</u>

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# 1 GENERAL INFORMATION

## 1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100
Fax Number	+86 755 6182 4271

## 1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

## 1.3 Laboratory Condition

Ambient Temperature	20°C to 25°C
Ambient Relative Humidity	45% to 55%
Ambient Pressure	100 kPa to 102 kPa

## 1.4 Announce

- (1) The test report reference to the report template version v4.1.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (7) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

## 2 PRODUCT INFORMATION

### 2.1 Applicant Information

Applicant	Konec Home Pty Ltd
Address	Suite 5.02 level 5 15 Talavera Road Macquarie Park NSW 2113 Australia

### 2.2 Manufacturer Information

Manufacturer	Lumi United Technology Co., Ltd
Address	8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen, China

### 2.3 Factory Information

Factory	N/A
Address	N/A

### 2.4 General Description for Equipment under Test (EUT)

EUT Name	Motion Sensor
Model Name Under Test	RTCGQ11LM
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V1.0.1
Software Version	V1.0.1
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

## 2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No.	CR2450
	Serial No.	N/A
	Capacity	N/A
	Rated Voltage	3.0 V
	Limit Charge Voltage	N/A

## 2.6 Technical Information

Network and Wireless connectivity		Zigbee
Interfaces present on the EUT	AC Ports	No AC Ports.
	DC Ports	From power supply to EUT, the DC port cable length is less than 3m.
	I/O Ports	No I/O Ports.
	Telecom Ports	No Tel ports.

### 3 SUMMARY OF TEST RESULTS

#### 3.1 Test Standards

No.	Identity	Document Title
1	AS/NZS CISPR 32: 2015+AMD1:2020	Electromagnetic compatibility of multimedia equipment — Emission requirements

#### 3.2 Verdict

No.	Base Standard	Description		Test Verdict	Result	Remark
Emission						
1	CISPR 32	Radiated Emission	Below 1 GHz	Pass	ANNEX A.1	--
			Above 1 GHz	Pass		Note 1
2	CISPR 32	Conducted Emission	Mains terminals	N/A	ANNEX A.2	--
			Asymmetric mode	N/A	ANNEX A.3	Note 2
			Differential voltage	N/A	ANNEX A.4	Note 3
Note 1: The highest frequency of the internal sources of the EUT is above 108 MHz, the measurement shall be made above 1 GHz. Note 2: For cables longer than 3 m only. Note 3: For Class B broadcasting receiver only.						

#### 3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)	2.96 dB
Radiated emissions (30 MHz-1 GHz)	3.67 dB
Radiated emissions (1 GHz-18 GHz)	3.57 dB
Radiated emissions (18 GHz-40 GHz)	5.16 dB

## 4 GENERAL TEST CONFIGURATIONS

### 4.1 Test Environments

Environment Parameter	Selected Values During Tests			
	Temperature	Voltage	Relative Humidity	Ambient Pressure
Normal Temperature, Normal Voltage (NTNV)	23°C to 25°C	DC 3V from battery	50% to 55%	100 kPa to 102 kPa

### 4.2 Test Equipment

Radiated Emission Test For Frequency Below 1 GHz (10 m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWABE RZ	ESRP	101036	2020.06.09	2021.06.08	<input type="checkbox"/>
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-0883	2020.05.11	2022.05.10	<input type="checkbox"/>
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60 *7.35m	N/A	2018.08.08	2021.08.07	<input type="checkbox"/>

Radiated Emission Test For Frequency Below 1 GHz (3 m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2020.09.18	2021.09.17	<input checked="" type="checkbox"/>
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-624	2019.07.02	2021.07.01	<input checked="" type="checkbox"/>
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2020.03.16	2023.03.15	<input checked="" type="checkbox"/>

Radiated Emission Test For Frequency Above 1 GHz						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2020.09.18	2021.09.17	<input checked="" type="checkbox"/>
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	9120D-1917	2019.07.02	2021.07.01	<input checked="" type="checkbox"/>
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2020.03.16	2023.03.15	<input checked="" type="checkbox"/>

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2020.06.08	2021.06.07	<input type="checkbox"/>
LISN	SCHWARZBECK	NSLK 8127	8127-687	2020.06.09	2021.06.08	<input type="checkbox"/>
ISN	TESEQ	ISN T800	34449	2020.09.18	2021.09.17	<input type="checkbox"/>
ISN	TESEQ	ISN T8-CAT6	53561	2020.06.09	2021.06.08	<input type="checkbox"/>
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.4m*3.1m*2.8m	N/A	2018.08.16	2021.08.15	<input type="checkbox"/>

#### 4.3 Test Enclosure list

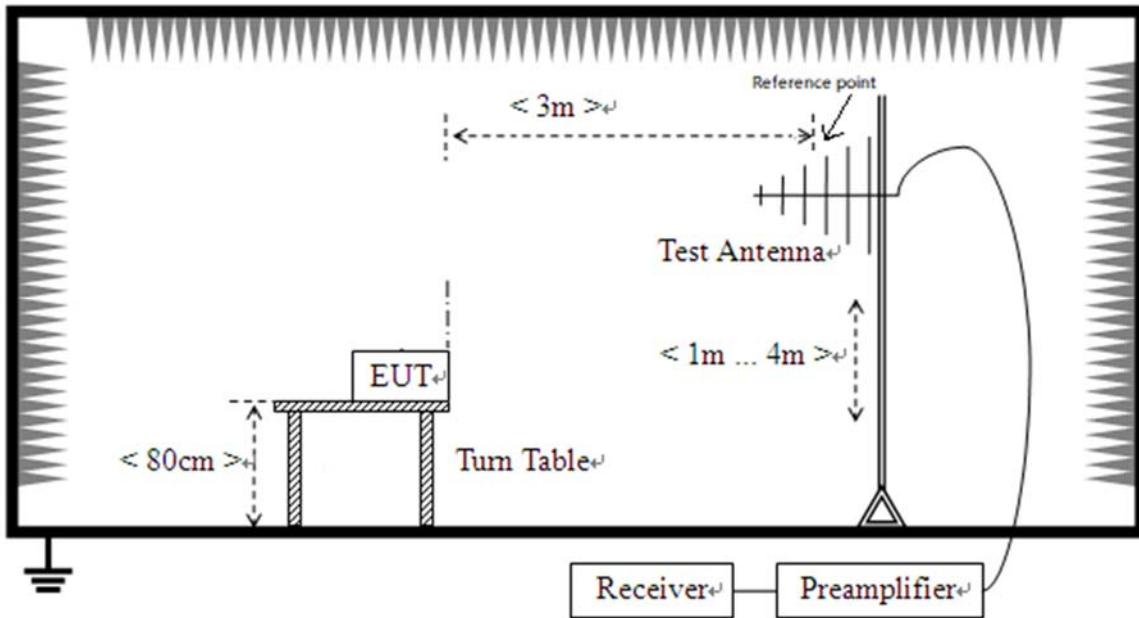
Description	Manufacturer	Model	Serial No.	Length	Description	Use
Phone	HUAWEI	P30	N/A	N/A	N/A	<input checked="" type="checkbox"/>
Adapter	OPPO	AK903HK	N/A	N/A	N/A	<input checked="" type="checkbox"/>
Gateway M2	N/A	N/A	N/A	N/A	N/A	<input checked="" type="checkbox"/>
USB Cable	N/A	N/A	N/A	1.5 m	Shielded with core	<input checked="" type="checkbox"/>

## 4.4 Test Configurations

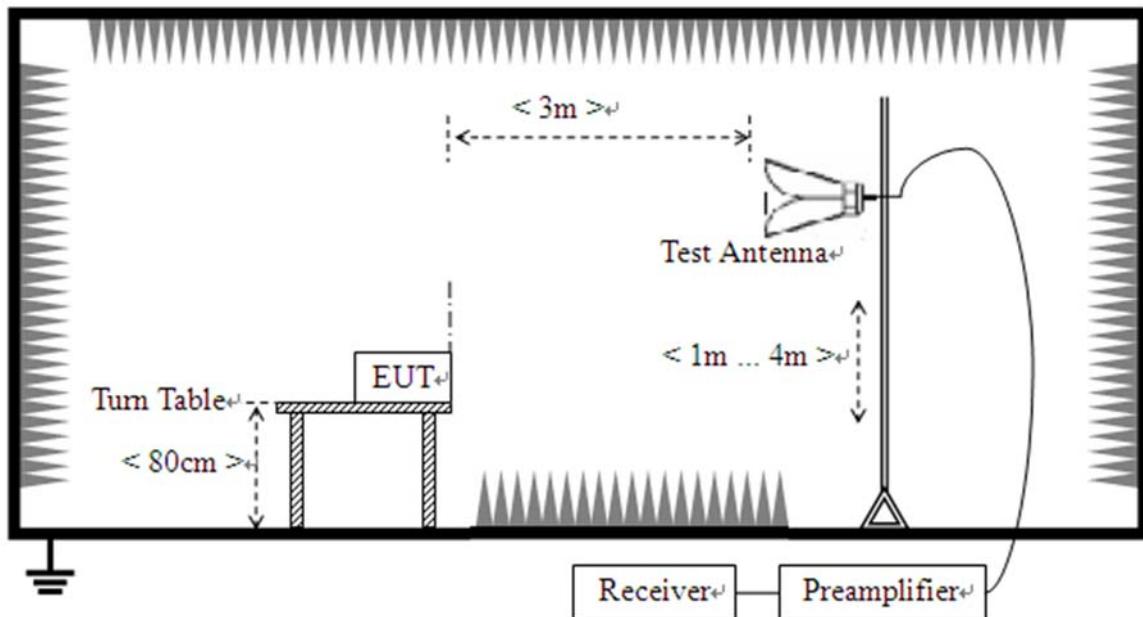
Test Configurations (TC) No.	Description
TC01	<u>The Working Test Mode</u> EUT + Battery + USB Cable + Adapter + Gateway M2 + Phone

## 4.5 Test Setups

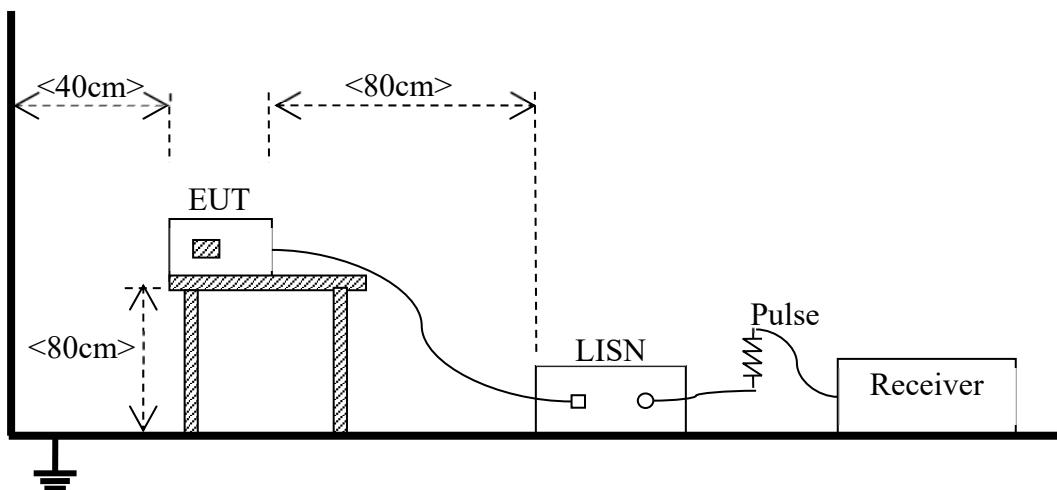
### Test Setup 1



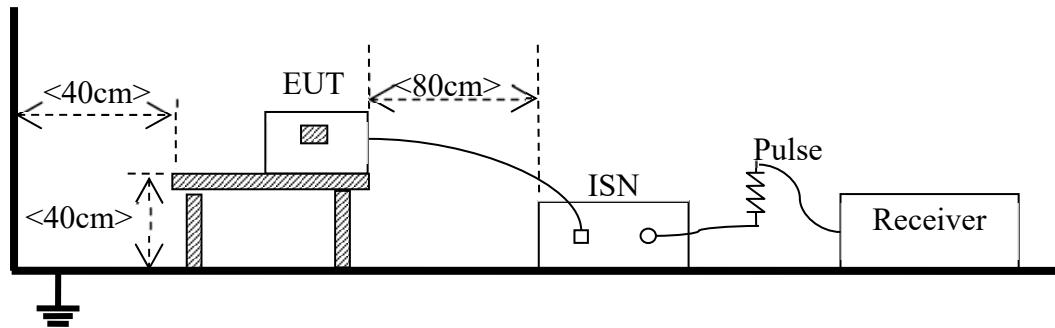
(For Radiated Emission Test (30 MHz-1 GHz))



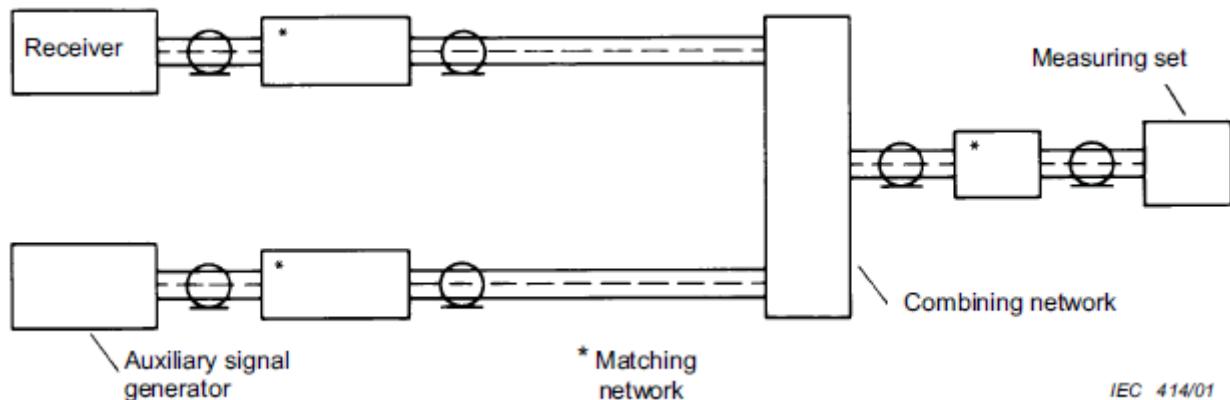
(For Radiated Emission Test (above 1 GHz))

Test Setup 2

(For Conducted disturbance voltage at mains terminals Test)

Test Setup 3

(For Conducted disturbance for asymmetric mode Test)

Test Setup 4

(For Conducted differential voltage emission (TV/FM broadcast receiver tuner ports))

## 4.6 Test Conditions

Test Case	Test Conditions	
Radiated Emission	Test Env.	NTNV
	Test Setup	Test Setup 1
	Test Configuration	TC01 <small>Note</small>
Note: Based on client request, all normal using modes of the normal function were tested, but only the worst test data of test mode is reported in this report. The Working Test Mode is the worst mode in this report.		

## 5 TEST ITEMS

### 5.1 Emission Tests

#### 5.1.1 Radiated Emission

##### 5.1.1.1 Limit

Frequency range (MHz)	Class A (at 3 m)		Class B (at 3 m)	
	Quasi-Peak Limit (dB $\mu$ V/m)		Quasi-Peak Limit (dB $\mu$ V/m)	
30 - 230		50		40
230 - 1000		57		47

Frequency range (MHz)	Class A (at 3 m)		Class B (at 3 m)	
	Peak Limit (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)
1000-3000	76	56	70	50
3000-6000	80	60	74	54

Requirements for radiated emissions from FM receivers

Frequency range (MHz)	Measurement		Quasi-Peak Limit (dB $\mu$ V/m) Fundamental	Quasi-Peak Limit (dB $\mu$ V/m) Harmonics	Quasi-Peak Limit (dB $\mu$ V/m) Other
	Facility	Distance (m)			
30-230	OATS/SAC	10	50	42	30
230-300				42	37
300-1000				46	37
30-230	OATS/SAC	3	60	52	40
230-300				52	47
300-1000				56	47

NOTE:

- 1) The lower limit shall apply at the transition frequency.
- 2) Additional provisions may be required for cases where interference occurs.

#### 5.1.1.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 1. The photo of test setup please refer to ANNEX B.

#### 5.1.1.3 Test Procedure

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

#### 5.1.1.4 Test Result

Please refer to ANNEX A.1.

## 5.1.2 Conducted disturbance voltage at mains terminals

### 5.1.2.1 Test Limit

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dB $\mu$ V)	Average (dB $\mu$ V)	Quasi-peak (dB $\mu$ V)	Average (dB $\mu$ V)
0.15 - 0.50	79	66	66-56	56-46
0.50 - 5	73	60	56	46
5 - 30	73	60	60	50

NOTE:

- 1) The lower limit shall apply at the band edges.
- 2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

### 5.1.2.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 2. The photo of test setup please refer to ANNEX B.

### 5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

### 5.1.2.4 Test Result

Please refer to ANNEX A.2.

### 5.1.3 Conducted disturbance for asymmetric mode

#### 5.1.3.1 Test Limit

Frequency range (MHz)	Class A		Class B	
	Quasi-peak (dB $\mu$ V)	Average (dB $\mu$ V)	Quasi-peak (dB $\mu$ V)	Average (dB $\mu$ V)
0.15 - 0.50	97-87	84-74	84-74	74-64
0.50 - 30	87	74	74	64

NOTE:

- 1) The lower limit shall apply at the band edges.
- 2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

#### 5.1.3.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 3. The photo of test setup please refer to ANNEX B.

#### 5.1.3.3 Test Procedure

Measurement of common mode (asymmetric mode) current or voltage emissions at wired network ports for attachment of unscreened balanced pairs shall be performed with the wired network port connected by a cable to an AAN. The AAN shall define the common mode termination impedance seen by the wired network port during the emission measurements.

The voltage division factor shall be added to the measured voltage measured by the receiver directly at the voltage measurement port of the AAN and the result compared with the voltage limits as applicable.

#### 5.1.3.4 Test Result

Please refer to ANNEX A.3.

## 5.1.4 Conducted differential voltage emission

### 5.1.4.1 Test Limit

Applicability	Frequency range (MHz)	Differential voltage limit @75Ω(dBuV)		
		Local Oscillator Fundamental	Local Oscillator Harmonics	Other
Television receivers; video recorders; PC TV broadcast receiver tuner cards; Digital audio receivers	30 to 950	46	46	46
	950 to 2150	54	54	46
Tuner units (not the LNB) for satellite signal reception	950 to 2150	54	54	46
FM audio receivers and PC tuner cards	30 to 300	54	50	46
	300 to 1000	54	52	46
FM car radios	30 to 300	66	59	46
	300 to 1000	66	52	46
RF modulator output ports connect to TV broadcast receiver tuner ports	30 to 950	76	46	46
	950 to 2150	N/A	54	46

### 5.1.4.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 4. The photo of test setup please refer to ANNEX B.

### 5.1.4.3 Test Procedure

1. The impedance as seen from the TV/FM broadcast receiver tuner port of the EUT shall be equal to the nominal antenna input impedance for which the port has been designed. The EUT shall be tuned to the wanted signal from the AE (signal generator). The emission level shall be measured across the relevant frequency range taking into account the attenuation between the EUT TV/FM broadcast receiver tuner port and the measurement device.
2. The RF modulator output port of the EUT is connected to the input of the measuring device by means of a coaxial cable and a matching network (if necessary). The characteristic impedance of the cable shall be equal to the nominal output impedance of the EUT. The EUT shall produce an RF carrier modulated by a video signal defined. The RF output level shall be obtained by adding the insertion loss of the matching network to the indication of the measuring device (tuned to the video carrier frequency and its harmonics).

### 5.1.4.4 Test Result

Please refer to ANNEX A.4.

## ANNEX A TEST RESULTS

### A.1 Radiated Emission

Note 1: The symbol of “--” in the table which means not application.

Note 2: Measurements shall be made with a quasi-peak measuring receiver in the frequency range 30 MHz to 1000 MHz.

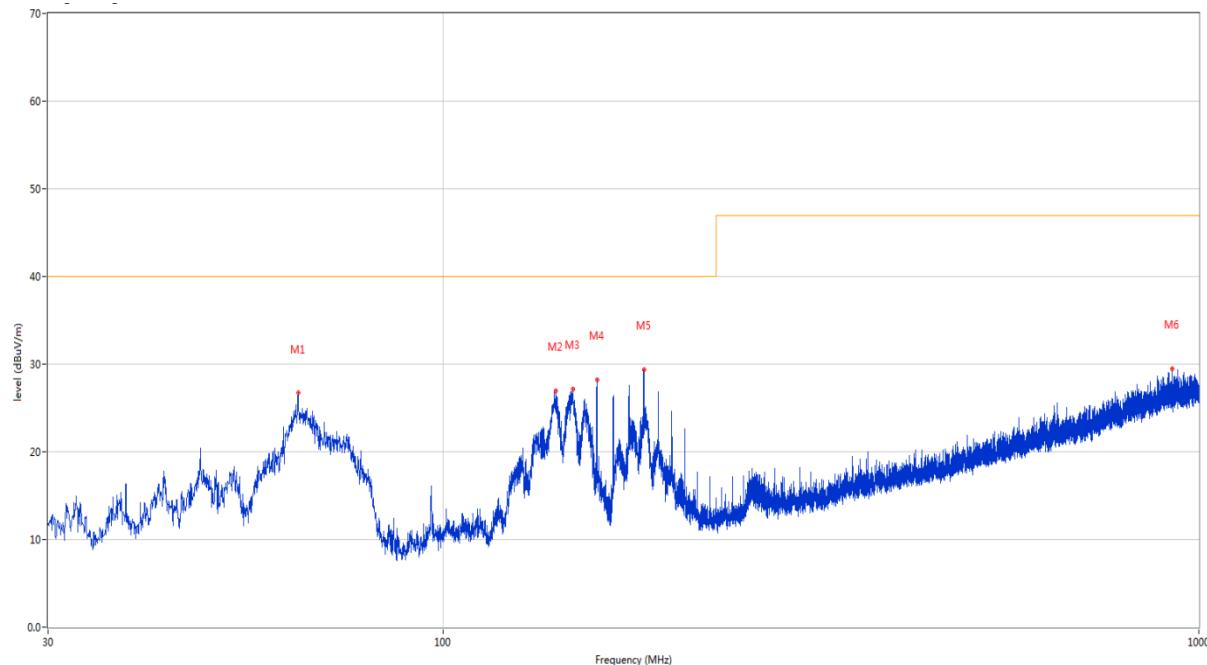
To reduce the testing time, a peak measuring receiver may be used instead of a quasi-peak measuring receiver. In case of dispute, measurement with a quasi-peak measuring receiver will take precedence.

Note 3: The marked spikes near 2400 MHz with circle should be ignored because they are Zigbee carrier frequency.

#### Test Data and Plots (Below 1 GHz)

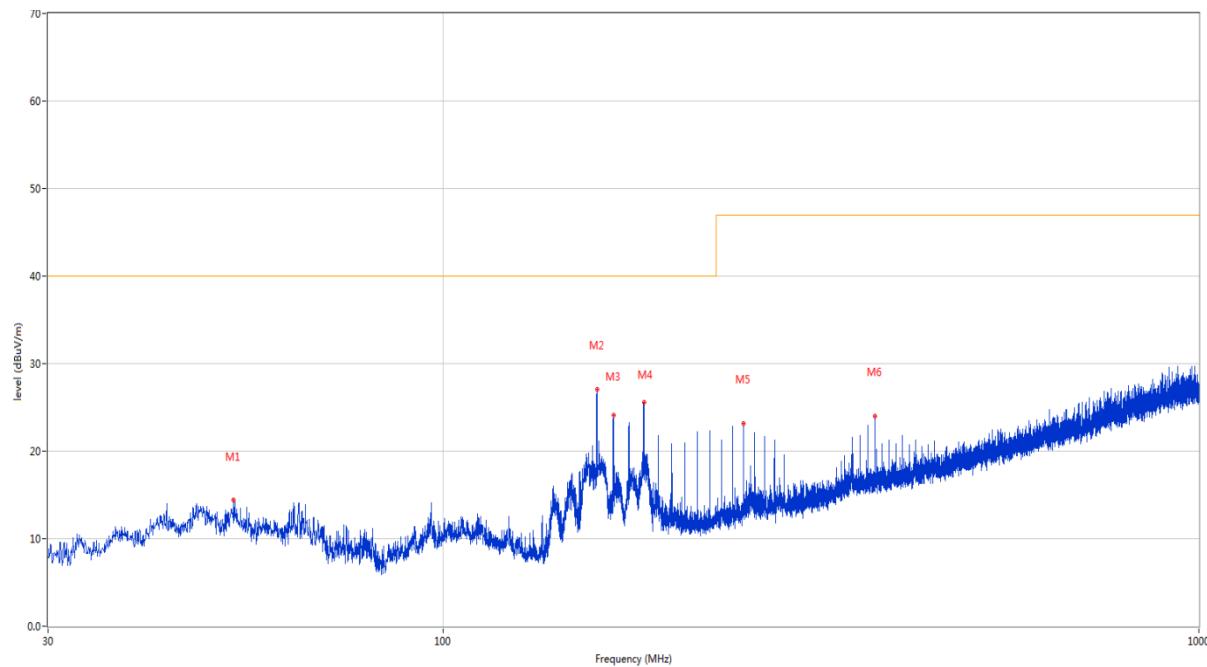
##### The Working Test Mode

###### A.1.1 Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	64.289	26.71	-24.97	40.0	-13.29	Peak	177.10	100	Vertical	Pass
2	141.016	26.92	-27.63	40.0	-13.08	Peak	33.10	100	Vertical	Pass
3	148.486	27.20	-28.04	40.0	-12.80	Peak	92.40	100	Vertical	Pass
4	159.738	28.23	-27.39	40.0	-11.77	Peak	109.40	100	Vertical	Pass
5	184.376	29.42	-25.34	40.0	-10.58	Peak	151.90	100	Vertical	Pass
6	921.575	29.47	-9.84	47.0	-17.53	Peak	0.80	100	Vertical	Pass

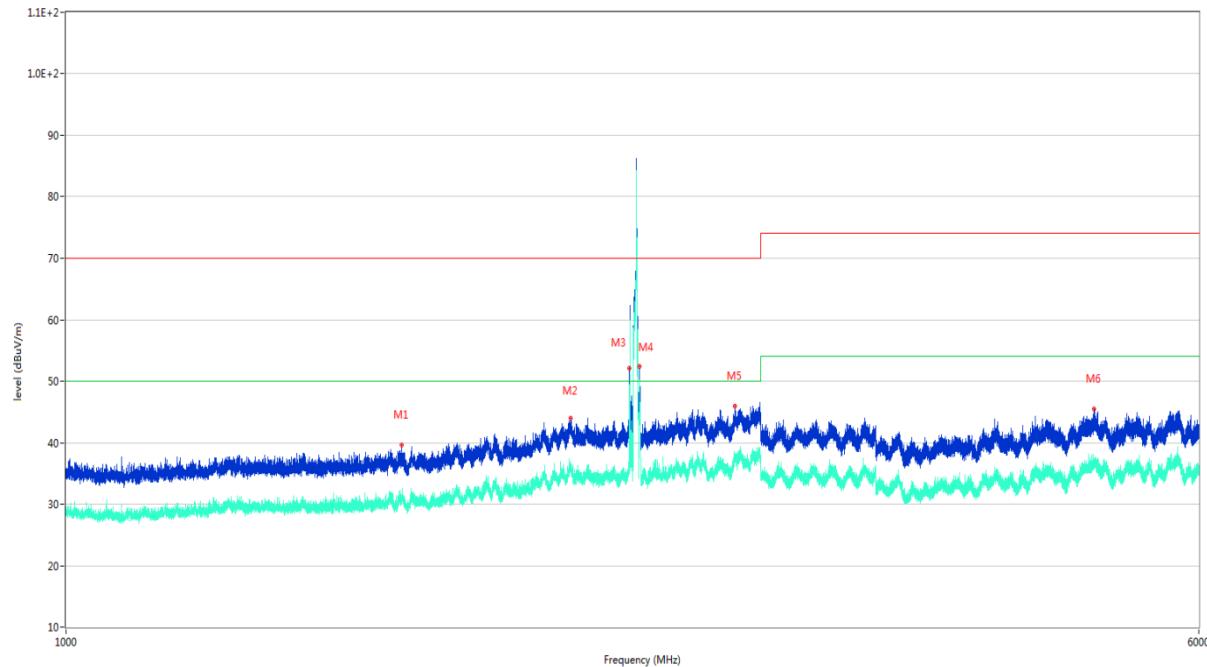
## A.1.2 Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	52.795	14.42	-23.04	40.0	-25.58	Peak	216.30	100	Horizontal	Pass
2	159.738	27.03	-27.39	40.0	-12.97	Peak	324.90	200	Horizontal	Pass
3	167.934	24.12	-27.16	40.0	-15.88	Peak	346.70	200	Horizontal	Pass
4	184.327	25.56	-25.34	40.0	-14.44	Peak	121.00	200	Horizontal	Pass
5	249.850	23.20	-22.91	47.0	-23.80	Peak	302.50	100	Horizontal	Pass
6	372.701	23.97	-19.62	47.0	-23.03	Peak	152.30	100	Horizontal	Pass

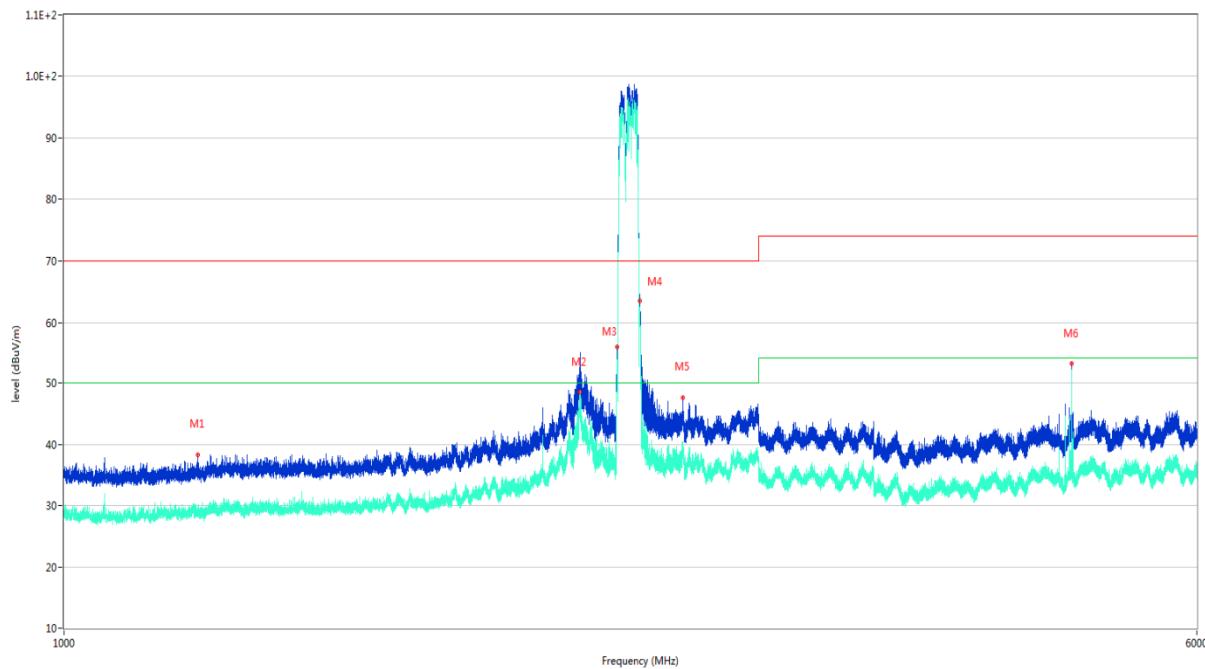
## Test Data and Plots (Above 1 GHz)

### A.1.3 Test Antenna Vertical, 1 GHz – 6 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1700.500	39.63	-14.09	70.0	-30.37	Peak	346.00	100	Vertical	Pass
1**	1700.500	30.70	-14.09	50.0	-19.30	AV	346.00	100	Vertical	Pass
2	2222.000	43.95	-8.39	70.0	-26.05	Peak	216.10	100	Vertical	Pass
2**	2222.000	36.18	-8.39	50.0	-13.82	AV	216.10	100	Vertical	Pass
3	2438.800	52.16	-8.52	70.0	-17.84	Peak	31.00	100	Vertical	N/A
3**	2438.800	47.78	-8.52	50.0	-2.22	AV	31.00	100	Vertical	N/A
4	2477.000	52.37	-9.93	70.0	-17.63	Peak	118.60	100	Vertical	N/A
4**	2477.000	50.10	-9.93	50.0	0.10	AV	118.60	100	Vertical	N/A
5	2881.400	45.95	-6.05	70.0	-24.05	Peak	58.50	100	Vertical	Pass
5**	2881.400	38.16	-6.05	50.0	-11.84	AV	58.50	100	Vertical	Pass
6	5086.350	45.51	-3.36	74.0	-28.49	Peak	278.30	100	Vertical	Pass
6**	5086.350	37.14	-3.36	54.0	-16.86	AV	278.30	100	Vertical	Pass

## A.1.4 Test Antenna Horizontal, 1 GHz – 6 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1236.400	38.34	-15.59	70.0	-31.66	Peak	22.90	100	Horizontal	Pass
1**	1236.400	28.77	-15.59	50.0	-21.23	AV	22.90	100	Horizontal	Pass
2	2259.200	49.39	-10.44	70.0	-20.61	Peak	358.80	100	Horizontal	Pass
2**	2259.200	48.48	-10.44	50.0	-1.52	AV	358.80	100	Horizontal	Pass
3	2400.005	55.86	-9.57	70.0	-14.14	Peak	304.70	100	Horizontal	N/A
3**	2400.005	53.03	-9.57	50.0	3.03	AV	304.70	100	Horizontal	N/A
4	2486.500	63.53	-9.33	70.0	-6.47	Peak	309.40	100	Horizontal	N/A
4**	2486.500	61.41	-9.33	50.0	11.41	AV	309.40	100	Horizontal	N/A
5	2660.900	47.53	-8.33	70.0	-22.47	Peak	358.80	100	Horizontal	Pass
5**	2660.900	40.24	-8.33	50.0	-9.76	AV	358.80	100	Horizontal	Pass
6	4923.900	53.15	-4.15	74.0	-20.85	Peak	269.90	100	Horizontal	N/A
6**	4923.900	50.62	-4.15	54.0	-3.38	AV	269.90	100	Horizontal	N/A

## A.2 Conducted disturbance voltage at mains terminals Test

Note: Not applicable.

## A.3 Conducted disturbance for asymmetric mode

Note: Not applicable.

## A.4 Conducted differential voltage emission

Note: Not applicable.

## **ANNEX B TEST SETUP PHOTOS**

Please refer the document "BL-SZ2140982-AE.PDF".

## **ANNEX C EUT EXTERNAL PHOTOS**

Please refer the document "BL-SZ2140982-AW.PDF".

## **ANNEX D EUT INTERNAL PHOTOS**

Please refer the document "BL-SZ2140982-AI.PDF".

--END OF REPORT--